

AMENDMENTS TO THE SPECIFICATION

Please amend the paragraph below as follows:

[0003] Robots and robotic devices are used today to perform tasks traditionally considered dangerous or otherwise inappropriate for humans, due to size or environmental considerations. For example, robots are often purposefully exposed to situations where the risk to a human being in a similar situation is too high. In one illustrative example, explosive ordnance disposal (“EOD”) robots are used to approach, inspect, and even remove or defuse explosives or objects that may contain explosives. Generally, a human operator of an EOD robot remains at a safe distance from the explosive (or possibly explosive) object and directs the EOD robot remotely as it performs its necessary tasks. Even though the EOD robots are often driven by remote control, incorporation of a physical tether between the robot and a base station near the operator is often favored. Tethered robots and other robotic platforms are being developed. For example, U.S. Patent Nos. 6,263,989, 6,431,296, and 6,668,951 each disclose Robotic Platforms, the disclosures of which are hereby incorporated by reference in their entireties.

Please amend the paragraph below as follows:

[0017] Contrasted with the prior art depicted in FIG. 1, a schematic view of a mobile robot 24 employing a cable handling system in accordance with one embodiment of the invention is shown during operation in FIG. 2. The mobile robot 24 includes a platform 25 to support various on-board devices and apparatus, and a drive system 27, which in this embodiment includes tank-type treads, motors, gears, etc. The depicted components are similar to those in FIG. 1: a robot 24, is operated through an area 22, around and between obstacles 20, by an operator (not shown) near a stationary base 26. The robot 24 leaves in its path a cable 28 that is dispensed and retrieved as the robot 24 moves away from and toward the base 26. The handling system of the present invention, however, deploys and retrieves the cable 28 with substantially no tension and, thus, kinks are eliminated on the cable 28. Additionally, because the cable is under no tension between the robot 24 and its end point attachment to the base 26, wear on the cable 28 is greatly reduced and the possibility of traumatic damage caused by the operating environment is virtually eliminated.

Please amend the paragraph below as follows:

[0019] The handling system of the present invention could also be used in devices much less sophisticated than an EOD robot. Generally, any type of mobile platform (examples of a mobile platform include the robot 24, a more specialized robot such as an EOD robot, etc.), whether remotely operated or not, that uses an

attached cable, could benefit from such a system. Such platforms include, for example and without limitation, electric vacuum cleaners and lawn mowers. The handling system of the present invention would be particularly useful in the latter application, as the risk of running over and cutting the trailing electric cable could be greatly reduced with appropriate tracking algorithms, since the cable is constantly being dispensed and retracted while the mower is operating. Regardless of the type of cable being employed, a slip ring typically may be used at the hub to connect the rotating cable to the onboard components that require the cable connection. For example, when fiber optic cable is employed, an optical slip ring or fiber optic rotary joint may be used.

Please amend the paragraph below as follows:

[0020] FIGS. 3A and 3B are schematic perspective views of a cable handling system 30 in accordance with one embodiment of the present invention. The handling system 30 includes a cable reel drive 100, a level wind mechanism 200, and a tension roller drive 300. A chassis or base 32 provides means for securing the cable handling system 30 to a robotic device or other platform 25. A first housing 34 contains microprocessors and/or other control components. Additionally, drive mechanisms (e.g., belts, chains, gears, etc.) and related power transmission components are contained in a second housing 36. Additional structural support for the components may be contained within the housings 34, 36. Alternatively, other external structures or exoskeletons may be used to attach the various components to the base 32.

Please amend the paragraph below as follows:

[0021] The orientation of the cable handling system 30 on a robot or other mobile platform may also vary. While this embodiment is depicted in an upright position, with the axis of rotation of the cable reel drive 100 in a horizontal orientation, other embodiments may be mounted in an inverted orientation (i.e., base 32 secured to the underside of a platform), or sideways. Moreover, the embodiment of the handling system 30 depicted in FIGS. 3A and 3B can be used as an after-market or retrofittable cable handling system. For example, the handling system 30 may be secured via the base 32 to the chassis of a mobile platform (such as the platform 25 of the mobile robot 24) that originally was not designed to carry a cable spool. In such a case, the control system would be integral with the cable handling system itself. For robots or other mobile platforms where the handling system of the present invention is a design expectation, the control system may be either part of the handling system, or integral with the other robot controls. Thus, the handling system 30 may be used to increase the versatility of robots or other mobile platforms that were traditionally limited in application.

Please amend the paragraph below as follows:

**[0052]** The rigid body transformation 870 takes in the vehicle velocity 868 in local vehicle coordinates and transforms this input velocity 868 to be the local velocity of the fiber exit point 872 of the handling system, factoring in the handling system mode input 874. This allows the fiber handling system to match vehicle movement regardless of mounting location or movement of the vehicle, including zero radius or neutral turns (spinning in place). The input to the rigid body transform function 870 is the linear and angular velocity of the vehicle 868 in its own local coordinate frame and the output is transformed, based on the position and orientation of the fiber exit point on the handling system (a parameter configured by the user for a particular installation). The vehicle velocity 868 is generally determined by employing one or more drive system sensors 869 to monitor the drive system of the robot or mobile platform. In order to account for inaccuracies in robot velocity correction to the cable speed, a correction factor may be introduced in the control system. For example, a corrective model with a multiplicative term and an additive term could be utilized. The multiplicative term may change when cable is being dispensed or retracted, and represents a relative adjustment to the robot velocity. The additive term may be used to provide a constant or user selectable offset under manual mode or possibly in some operational state.